Conant Brook
Massachusetts

# Conant Brook Dam
# Dam-Break Flood
# Analysis

FEBRUARY 1987

**US Army Corps of Engineers**
New England Division

# CONANT BROOK DAM
# CONNECTICUT RIVER BASIN
# MASSACHUSETTS

## DAM-BREAK FLOOD ANALYSIS

BY
HYDRAULICS AND WATER QUALITY SECTION
WATER CONTROL BRANCH
ENGINEERING DIVISION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

FEBRUARY 1987

## ACKNOWLEDGMENT

This report was prepared by Jon F. Szarek of the Hydraulics and Water Quality Section (HWQS), who conducted all associated hydraulic analysis. Supervisory direction was provided by Charles J. Wener, Chief, HWQS.

# CONANT BROOK DAM PROJECT
# DAM-BREAK FLOOD ANALYSIS

## TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF PLATES

# CONANT BROOK DAM PROJECT
# DAM-BREAK FLOOD ANALYSIS

## 1. INTRODUCTION AND PURPOSE

This report presents the findings of a dam-break flood analysis performed for the Conant Brook Dam, an existing Corps of Engineers flood control project, which is located on Conant Brook at Monson, Massachusetts.

Conant Brook, the principal tributary of Chicopee Brook, joins Chicopee Brook in South Monson 5.7 miles upstream from the Quaboag River (see plate 1).

Chicopee Brook flows in a northerly direction through the center of South Monson, Monson and North Monson and joins the Quaboag River 4.6 miles upstream from the Chicopee River. The confluence of the Quaboag and Chicopee Rivers is 18 miles upstream from the Connecticut River.

Included in this report is a description of the pertinent features of the dam, the procedure used for the analysis, the assumed dam-break conditions, the resulting effect on downstream flooded areas, and the effects of varying conditions (sensitivity tests) on the resulting downstream flood. This study was performed not because of any known likelihood of a dam-break at Conant Brook Dam, but to provide quantitative information for emergency planning use in accordance with Corps of Engineers Regulations (ER 1130-2-419).

## 2. PROCEDURE

The Conant Brook dam-break analysis was made using the "National Weather Service Dam-Break Flood Forecasting Computer Model", developed by D. L. Fread, Research Hydrologist, Office of Hydrology, National Weather Service, NOAA, Silver Spring, Maryland 20910. Input to the model consisted of: (a) storage characteristics of the reservoir, (b) selected geometry and duration of the breach development, and (c) hydraulic characteristics of the downstream river channel including tributary inflows, hydraulic roughness coefficients, and active and inactive flow regions.

Based on the input data, the model computes the dam-break outflow hydrograph and routes it downstream. Dynamic unsteady flow routing is performed by a "honing" iterative process governed by the requirements of both the principles of conservation of mass and momentum. The analysis provides

output on the attenuation of the flood hydrograph, resulting flood stages, and timing of the flood wave as it progresses downstream.

The approach used in this hypothetical dam-break analysis was to first apply the model using a selected set of conditions thought to be reasonably possible in a failure situation. The flood wave resulting from this analysis is termed the Base Flood condition. Due to the fact that any one of the major variables used in the model (initial pool elevation, antecedent riverflow, time of breach development, etc.) could differ in value or occur in different combination from those used in the Base Flood determination, sensitivity analyses were employed to determine what effect these altered variables would have upon the resulting flood wave.

Calibration of the model was accomplished by comparing the computed stage-discharge relationships with those known to exist at various locations along the river reach being modeled (i.e., at dams, streamflow gages, high watermarks, etc.).

## 3. DESCRIPTION OF STUDY AREA

a. General. The study area extends from Conant Brook Dam, downstream along Conant Brook and Chicopee Brook to the Conrail Railroad bridge on the Quaboag River at Palmer, a distance of 8.6 river miles. Along the study reach, the drainage area increases from 7.8 square miles at Conant Brook Dam to 210 square miles at the mouth of the Quaboag River, 3.4 miles downstream from the Conrail bridge. Major tributaries in the Chicopee River basin include the Swift, Quaboag and Ware Rivers.

In addition to Conant Brook Dam, another Corps of Engineers flood control project, Barre Falls Dam, is located in the Chicopee River watershed.

The Barre Falls Dam is located in Barre, Massachusetts on the Ware River. The dam is approximately 32 miles upstream from the confluence of the Ware and Swift Rivers and approximately 52 miles upstream from the mouth of the Chicopee River. Both Barre Falls and Conant Brook Dams are operated to reduce flood stages at downstream communities within the watershed.

A map of the Chicopee River basin is shown on plate 1 and a map showing the relationship of the Chicopee River watershed projects to the Connecticut River is provided on plates 2 and 3.

b. Conant Brook Dam. This dam, constructed in the town of Monson, Massachusetts by the Corps of Engineers, is a single-purpose flood control project. Construction of the dam was completed during September 1966. This project is 1 of 2 flood control reservoirs in the Chicopee River basin and 1 of 16 flood control reservoirs within the Connecticut River basin which were built by the Corps of Engineers.

The Conant Brook Dam embankment, approximately 1,050 feet in length with a maximum height of 85 feet above the streambed, consists of rolled earthfill with an impervious core and rock slope protection. The top of the dam, elevation 771 feet, NGVD, provides 9.0 feet of spillway surcharge and 5.0 feet of freeboard. The top width of 20 feet accommodates a 16-foot paved access road and the embankment slopes vary from 1V on 3H to 1V on 2.5H.

A photograph, general plan and cross section through the outlet works are shown on plates 4, 5 and 6.

At spillway crest, elevation 757 feet, NGVD, the normally dry bed Conant Brook reservoir possesses a flood control capacity of 3,740 acre-feet, equivalent to 9.0 inches of runoff from the 7.8-square mile upstream drainage area. When filled to spillway crest, the reservoir will have a surface area of 158 acres. Other pertinent data is listed in table 1.

c. Downstream Valley. Conant Brook, the principal tributary of Chicopee Brook, joins Chicopee Brook approximately 1.7 miles downstream from Conant Brook Dam. Chicopee Brook flows in a northerly direction through the center of South Monson, Monson and North Monson and joins the Quaboag River 4.6 miles upstream from Chicopee River.

The two brooks have a total drainage area of 23.8 square miles at the confluence of Chicopee Brook and the Quaboag River. The drainage area, which is L-shaped, has a total length of 8 miles and an average width of 3 miles. The watershed is entirely within the town limits of Monson except for a small portion at the upper end of Conant Brook which is in the town of Wales.

Conant Brook is very steep from its source to approximately 500 yards upstream from its confluence with Chicopee Brook. Within this reach, the channel of Conant Brook falls approximately 250 feet in 1.4 miles for an average gradient of 179 feet per mile. From Conant Brook to North Monson, Chicopee Brook flows through a narrow flat valley bounded on both sides by high steep hills.

TABLE 1

CONANT BROOK DAM PROJECT
PERTINENT DATA

| | | |
|---|---|---|
| Location: | Conant Brook; Monson, Massachusetts | |
| Drainage Area: | 7.8 square miles | |
| Reservoir: | Outlet Works Intake (Invert) | 694 feet NGVD |
| | Flood Control Pool (Spillway Crest) | 757 feet NGVD |
| Dam: | Type | Earth w/rockfill slope protection |
| | Length | 1050 feet |
| | Top Width | 20 feet |
| | Top Elevation | 771 feet NGVD |
| | Maximum Height | 85 feet |
| Spillway: | Type | Uncontrolled, ogee weir, chute spillway |
| | Length | 100 feet |
| | Crest Elevation | 757 feet NGVD |
| | Surcharge | 9.0 feet |
| | Capacity | 10,750 cfs |
| Outlet Works: | Type | Concrete conduit |
| | Tunnel Length | 405 feet |
| | Service Gates, Type | None; Self-regulating by orifice control |
| | Maximum Capacity at Spillway Crest | 225 cfs |
| | Downstream Channel Capacity | 225 cfs |

Between river miles 5 and 7, Chicopee Brook meanders through an extensive swampy area which acts as a natural reservoir during times of flood. Average gradient in this reach is approximately 7.5 feet per mile. Flooding in this area is further complicated by a backwater effect from the Quaboag River which encompasses a drainage area of approximately 200 square miles at this location. The maximum elevation during any flood in this area depends on the coincidence of the flood flows from Chicopee Brook and the Quaboag River. It is possible for this area to be flooded from the Quaboag River without any substantial flow from Chicopee Brook.

The final reach of the study area extends along the Quaboag River, from the mouth of Chicopee Brook to the Conrail bridge situated 3.4 miles upstream from the confluence of the Quaboag and Chicopee Rivers. The channel invert within this zone is relatively flat, with an average slope of 6.7 feet per mile.

Conant Brook, Chicopee Brook and the Quaboag River are crossed by numerous State highways, railroad lines and local roads. These crossings are indicated on plan and profile, plates 7 and 8.

Following is a brief description of the downstream dams in their order of appearance:

(1) Zero Manufacturing Company Dam (also known as Ellis No. 1 Dam). This dam, located approximately 1.9 miles downstream from Conant Brook Dam, is a 150-foot long stone masonary-concrete structure. It was erected during the year 1900. With a height of 18.2 feet, it has a maximum impounding capacity of 70 acre-feet. The spillway is a 76-foot long narrow crested weir. Zero Manufacturing Company Dam possesses a drainage area of 14.8 square miles of which 2.7 percent is ponds and swamps.

Approximately 25 feet downstream from the dam, Chicopee Brook passes beneath a factory building (owned by Zero Manufacturing Co.) through an opening 80 feet wide by 4.5 feet high. There are approximately 10 building support columns founded on piers which obstruct flow in the channel. In the event of Conant Brook Dam failure, the building would likely suffer severe damage.

(2) C.F. Church Company Dam. This dam is located in North Monson, Massachusetts on Chicopee Brook approximately 4.8 miles downstream from Conant Brook Dam. It possesses a maximum height of 16 feet with a maximum storage capacity of 60 acre-feet. With a crest length of 75 feet, the maximum

spillway discharge is 1,000 cfs with the water surface at the top of the dam.

In addition, an unnamed dam at river mile 4.2 is breached at elevation 341.7 feet, NGVD. This structure would have no effect on the dam failure flood wave levels and was therefore ignored.

## 4. ASSUMED DAM-BREAK CONDITIONS

a. General. The magnitude of a flood resulting from the hypothetical failure of Conant Brook Dam is a function of many different parameters. Included among these parameters are: (1) size of the dam and reservoir, (2) dimensions of the breach, (3) initial pool level, (4) rate of breach formation, (5) channel and overbank roughness, and (6) antecedent flow conditions. Engineering assumptions of conditions which could reasonably be expected to exist prior to a failure of Conant Brook Dam and which assumptions were used in the Base Flood analysis are presented below.

b. Selected Base Flood. Parameters and their values used in the Base Flood profile analysis are defined in the following tabulation:

Prebreach Flow - Conant Brook, Chicopee Brook and Quaboag River: flow resulting from the flood of 18-20 August 1955 after routing through flood control storage. A constant flow rate of 225 cfs from Conant Brook Dam, equivalent to the maximum outlet works capacity with the pool at spillway crest, was used for this study.

Initial Pool Level - Conant Brook Dam: water surface at spillway crest elevation 757.0 feet, NGVD.

Breach Invert - Elevation 700 feet, NGVD

Breach Dimension - Width = 150 feet; Side Slopes = 2V on 1H

Time to Complete Formation of Breach - 1 hour

Downstream Channel Roughness - Manning's "n" values used range between 0.055 and 0.095

Downstream Dam Failure - Due to their small impoundments and heights all downstream dams on Chicopee Brook were assumed to remain intact.

## 5. RESULTS

The resulting peak stage flood profile and the areal extent of inundation for the Base Flood conditions are shown on plates 7 and 8, respectively. Timing of the peak stage and leading edge of the flood wave is also indicated on the profile. The development of the peak stage profile along with discharge and stage hydrographs for three stations downstream from Conant Brook Dam are illustrated graphically on plate 9. The stations are located 1.9, 4.8, and 7.8 miles downstream from the dam.

Hydraulically, the dam-break flow throughout the limits of this study was considered to be predominantly "subcritical", i.e., both the energy and hydraulic grade lines are above the minimum depth required to pass the failure flow with minimum energy. However, immediately downstream from Conant Brook Dam, on Conant Brook, there exists a reach where the relatively steep slope of the brook would indicate the potential for hydraulically "supercritical" flow, i.e., the hydraulic grade line would be below the minimum depth required to pass the failure flow with minimum energy. This reach extends from the base of Conant Brook Dam to approximately 500 yards upstream from Conant Brook's confluence with Chicopee Brook. Within this reach, the brook falls approximately 250 feet in 1.4 miles. Though flow in this reach would be theoretically supercritical, the flow in this natural channel would actually be highly turbulent. Therefore, for illustrative purposes, rather than plotting the supercritical flow depths, critical depth was assumed within this reach, as shown on the respective plates.

The peak dam-break discharge from Conant Brook Dam would be 91,000 cfs producing a rise of approximately 27 feet above above the normal river depth at a point 1.4 miles downstream from the dam. From Conant Brook to Zero Manufacturing Company dam, on Chicopee Brook, the peak flow would attenuate to 64,000 cfs and the river rise would decrease to approximately 25 feet above the normal river stage. At C. F. Church Company dam, river mile 4.8, the wave would attenuate to a flow of 53,000 cfs with an attendant maximum rise over normal depth of 25 feet.

Progressing downstream along Chicopee Brook, from the Church Company dam to the confluence with the Quaboag River, there exists a storage area that is effective in attenuating the flood discharge. The effect of this storage area results in an attenuated peak discharge of 29,000 cfs at the con fluence of Chicopee Brook and the Quaboag River. Resulting river levels within this reach are approximately 16 feet

above normal river levels. The maximum elevation during any flood in this area depends on the coincidence of the flood flows from Chicopee Brook and the Quaboag River.

Continuing downstream along the Quaboag River to the Conrail bridge, river mile 8.6, the peak discharge was further attenuated from 29,000 cfs to 23,000 cfs with maximum rise over normal depth approximately 16 feet.

The dam-break analysis was terminated at the Conrail bridge since the water surface elevation produced from the dam-break flood analysis was less than the experienced August 1955 high watermarks at this point.

## 6. SENSITIVITY TESTS

In addition to the analysis under the assumed Base Flood conditions, subsequent studies were made to determine the sensitivity of certain selected parameters on the resulting downstream flood. These were made by applying the model to the same data set used for the Base Flood except that one parameter was varied in each simulation. Following is a listing of the variables used in the sensitivity testing and a discussion of the results of each test.

a. Antecedent Flow Conditions. The Base Flood analysis assumed a high flow already occurring in the river at the time of dam-break. This was considered appropriate since if a breach were to occur, it is quite conceivable that it would do so at a time of abnormally high flow conditions. Antecedent flow conditions on Conant Brook, Chicopee Brook and the Quaboag River were selected to equal the recurring record August 1955 floodflows as modified by the existing system of Corps of Engineers flood control reservoirs, namely, the Conant Brook project.

Specifically, model input data for inflow into Conant Brook Reservoir consisted of the recessional side of the natural August 1955 flood hydrograph which was then routed through the reservoir assuming the pool was already filled to spillway crest level during the rising side of the same hydrograph. The initial and peak outflow from Conant Brook Dam's outlet works were assumed to be constant at 225 cfs, equivalent to the maximum outlet works capacity with the pool at spillway crest.

Outflows from Conant Brook, Chicopee Brook, McIntosh Brook, Kidd Brook, Creamery Brook and the Quaboag River were also accounted for in the dam-break hydrograph routing analysis. The August 1955 hydrographs for each stream were initiated at their respective rates coincident with the peak

inflow to Conant Brook Dam and then continued through their accessional and recessional phases as appropriate, for the remainder of the routing analysis.

The adopted initial antecedent flows and the comparative experienced August 1955 discharges, as applicable, are shown in table 2.

A sensitivity analysis was made assuming lower antecedent riverflows and the resulting comparative flood stages are shown on plate 11. Discharges occurring prior to onset of the 1955 flood, which were assumed to remain constant, were used as the antecedent conditions for this sensitivity test.

As can be seen in the profile, although there is a substantial difference in stage between the two antecedent conditions, the resulting dam-break flood profiles show close agreement for the first 6 miles below Conant Brook Dam, thus indicating there is little sensitivity to initial flow conditions in the dam-break analysis in the reach close to the project. However, from this point downstream, the difference becomes greater, with the profile for the dam-break flood with low antecedent flow coinciding with the high antecedent flow profile at about river mile 7.5. This is primarily due to the reduced tributary inflow volumes (particularly from the Quaboag River) and the storage area effect within this reach.

b. Breach Width. The breach width was set at 100 feet for the Base Flood analysis. For sensitivity testing, two additional cases were evaluated. As shown by the comparative profiles on plate 10, the stage dropped by up to 4 feet in the first two miles downstream from the dam for a breach width of 75 feet. For a failure width of 50 feet, the inundation stage was raised up to 3 feet in the first 2 miles downstream from the dam.

In both instances, the stages resulting from varying the breach width approached Base Flood levels within several miles downstream from Conant Brook Dam.

c. Failure Time. The selected duration of the breach development for the Base Flood condition was one hour. For sensitivity assessment, analyses were also made with failure times of 0.5 and 2.5 hours. These breach development durations resulted in the inundation stages shown on plate 11. The shorter time for breach formation resulted in the stage increasing up to 3 feet above Base Flood levels in the first 2 miles. In the same reach, the longer failure time caused

TABLE 2

ANTECEDENT FLOODFLOW CONDITIONS

| Location | Adopted Antecedent Flows* (cfs) | August 1955 Flows (cfs) |
|---|---|---|
| Conant Brook | | |
| Conant Brook Dam<br>Monson, MA<br>(Inflow to dam) | 5,500 | 5,500 (est) |
| Chicopee Brook | | |
| Zero Mfg. Co. Dam<br>South Monson, MA<br>(1.9 miles downstream from Conant Brook Dam) | 1,600 | 2,300** (est) |
| C. F. Church Co. Dam<br>North Monson, MA<br>(4.8 miles downstream from Conant Brook Dam) | 3,100 | 6,000** (est) |
| Quaboag River | | |
| Conrail R.R. Bridge<br>Palmer, MA<br>(8.6 miles downstream from Conant Brook Dam) | 10,600 | 16,600*** (est) |

* Flow rate at instant of breach initiation.

** Experienced peak flow rate; not actually simultaneous with the initial flow rate chosen for inflow into Conant Brook Reservoir.

*** It was conservatively assumed for purposes of this failure routing that this flow would be occurring on the Quaboag River simultaneously with the dam failure flood wave reaching the mouth of Chicopee Brook.

stages to fall as much as 7 feet. In both alternative durations, the ponding effect caused by the extensive swampy area between river miles 5.0 and 7.0 controlled the flows such that there were essentially no changes in stage beyond river mile 5.0.

d. Initial Pool Level. An important factor in determining the magnitude of a dam-break flood is the level of the reservoir when the break occurs. Though a full reservoir condition (spillway crest, elevation 757 feet, NGVD) was adopted for the Base Flood analysis, a test of the sensitivity of the dam-break flood to initial pool level was made assuming a one-half full pool condition (elevation 725.0 feet, NGVD).

With the one-half full pool condition in effect, the resulting peak discharge immediately below Conant Brook Dam was determined to be 78 percent less than the adopted full pool condition. The relative reductions in stages below Base Flood levels corresponding to these modified discharges were approximately 16 feet along Conant Brook and approximately 14 to 2 feet along Chicopee Brook.

Comparative water surface profiles are shown on plate 10.

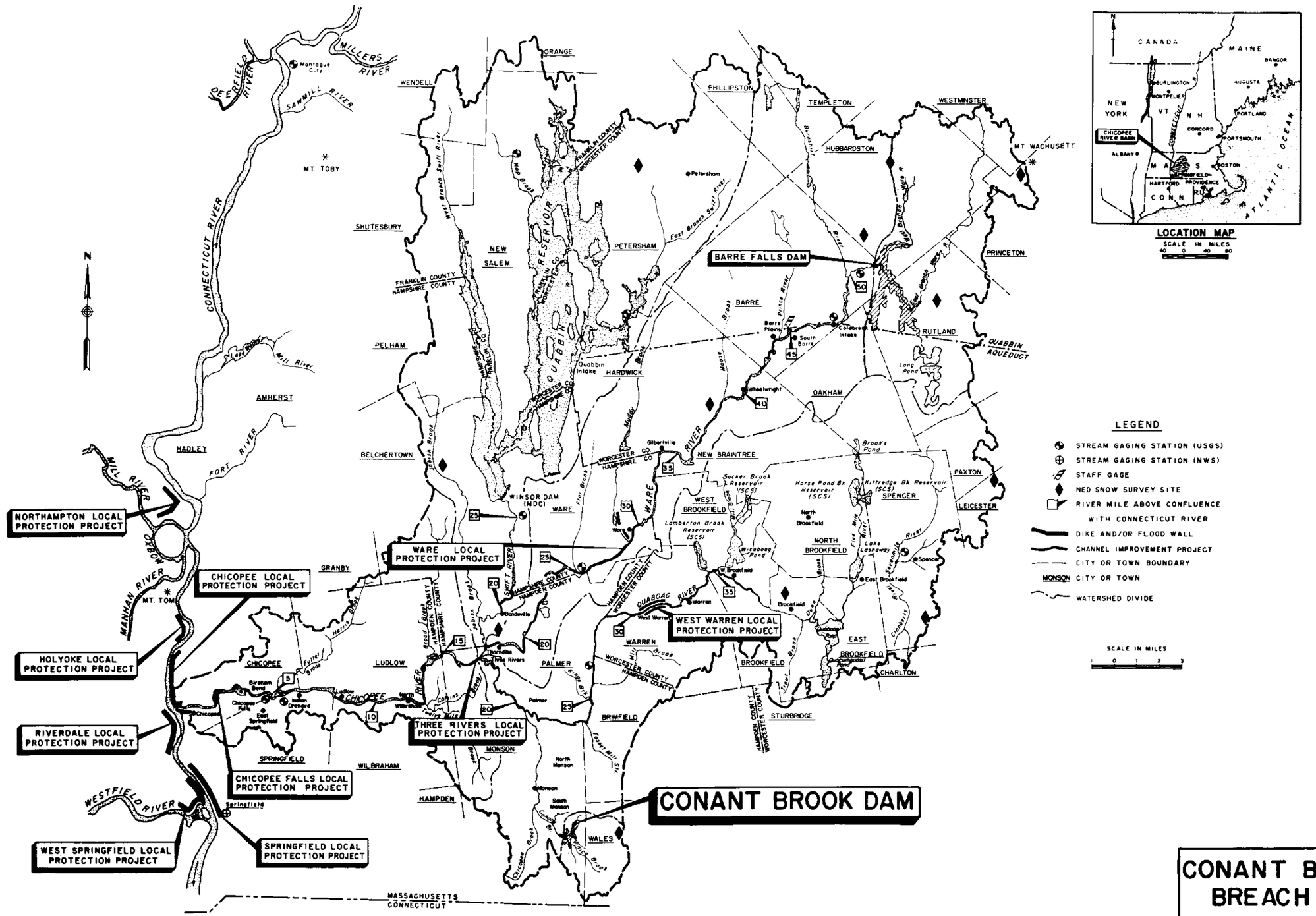
e. Channel Roughness. Sensitivity tests were made to determine the effect of Manning's "n" value on downstream flood attenuation, resulting stages and timing. Tests were made with Manning's "n" values 10 percent greater and 10 percent less than that used in the Base Flood condition.

Lowering the channel roughness (smaller "n" value) resulted in the faster movement of the flood wave with less attenuation. Increasing the channel roughness (greater "n" value) resulted in slower progression downstream with greater attenuation. However, the resulting variations in the downstream profiles were negligible, as illustrated on plate 12.

The most significant effect of varying the channel roughness was the difference in timing of the peak flood stage. At the lower end of Chicopee Brook, in Monson, this timing varied from approximately 4.20 to 4.45 hours for the lowest and highest "n" values, respectively. By comparison, the time of the peak flood stage at Monson for the Base Flood condition is approximately 4.40 hours.

## 7. DISCUSSION

The dam-break analysis for Conant Brook Dam was based on the engineering application of certain laws of physics, considering the hydrologic and hydraulic characteristics of the project and downstream channel, and conditions of failure. Due to the highly unpredictable nature of a dam-break and the ensuing sequence of events, results of this study should not be viewed as exact but only an approximate quantification of the dam-break flood potential. For purposes of analysis, downstream conditions are assumed to remain constant and no allowance is made for possible enlargement or relocation of the river channel due to scour or the temporary damming effect of debris all of which affect, to some extent, the resulting magnitude and timing of flooding downstream.

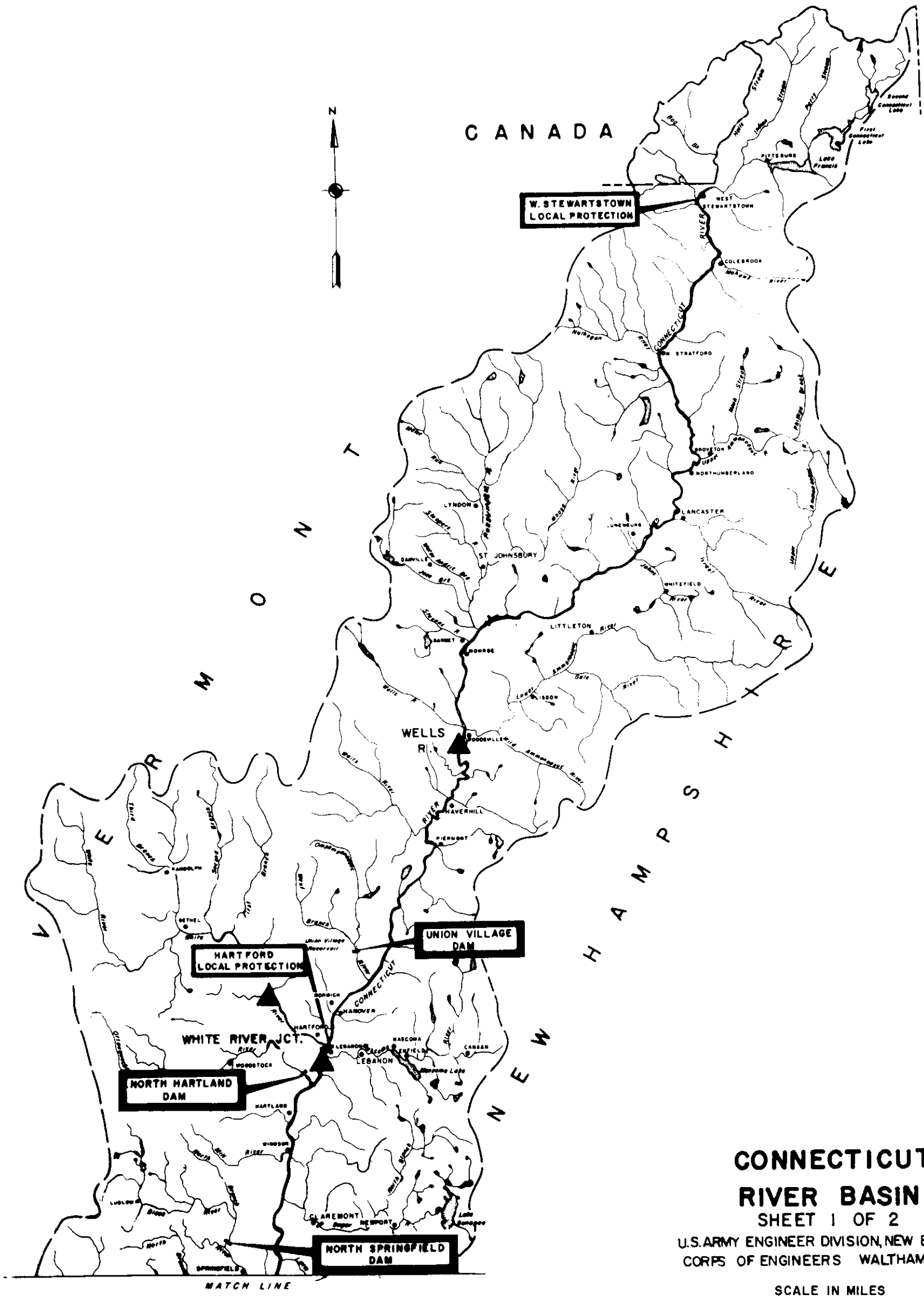



# CONANT BROOK DAM BREACH FLOOD

## CHICOPEE RIVER BASIN

HYD. AND WAT. QUAL. SECT.
FEBRUARY 1987

PLATE 1




# CONNECTICUT RIVER BASIN

SHEET 1 OF 2

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

SCALE IN MILES

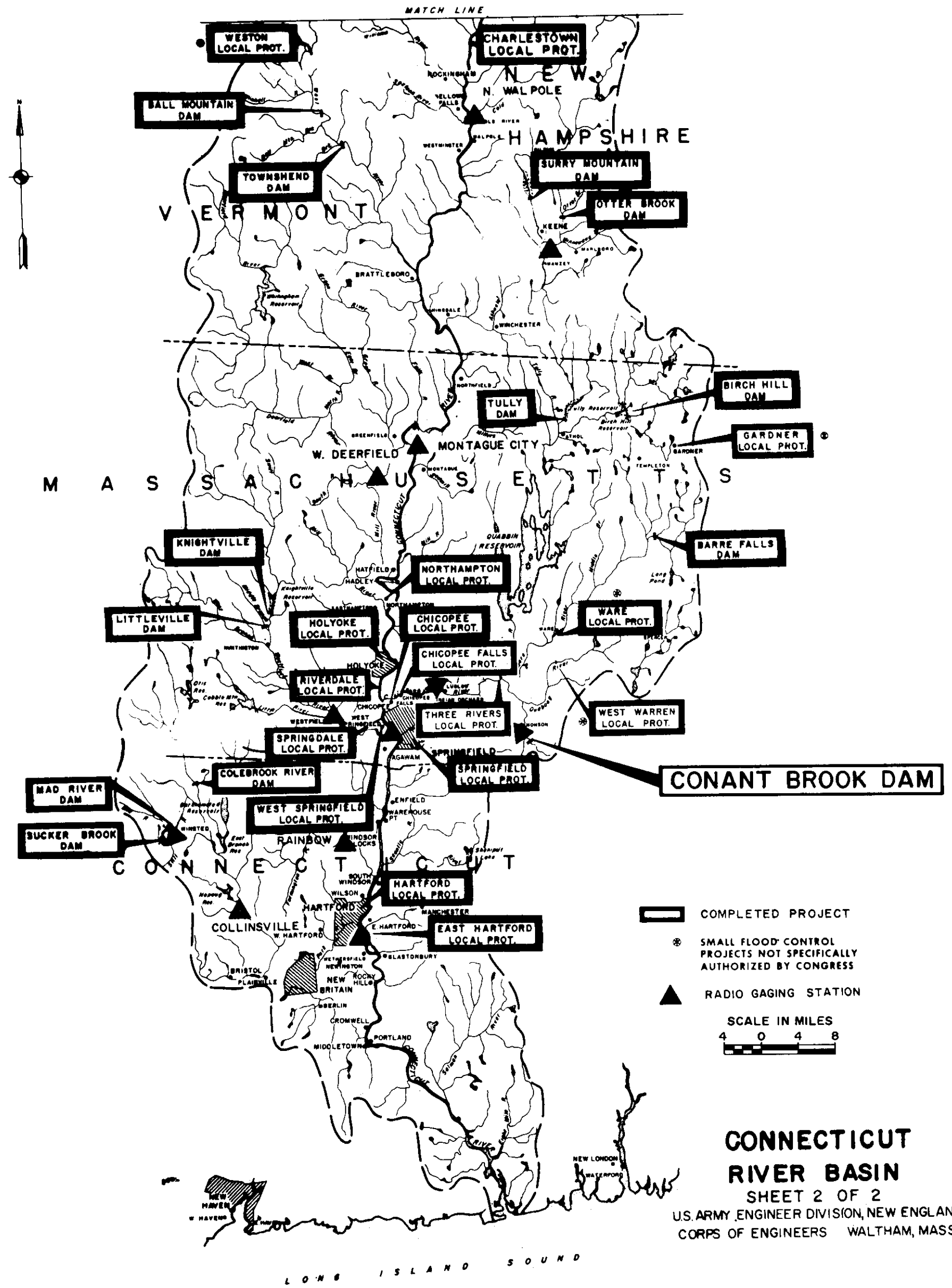
4 0 4 8

## CONANT BROOK DAM BREACH FLOOD

CONNECTICUT RIVER BASIN

HYD. AND WAT. QUAL. SECT.
FEBRUARY 1987

PLATE 2




# CONNECTICUT RIVER BASIN

SHEET 2 OF 2

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

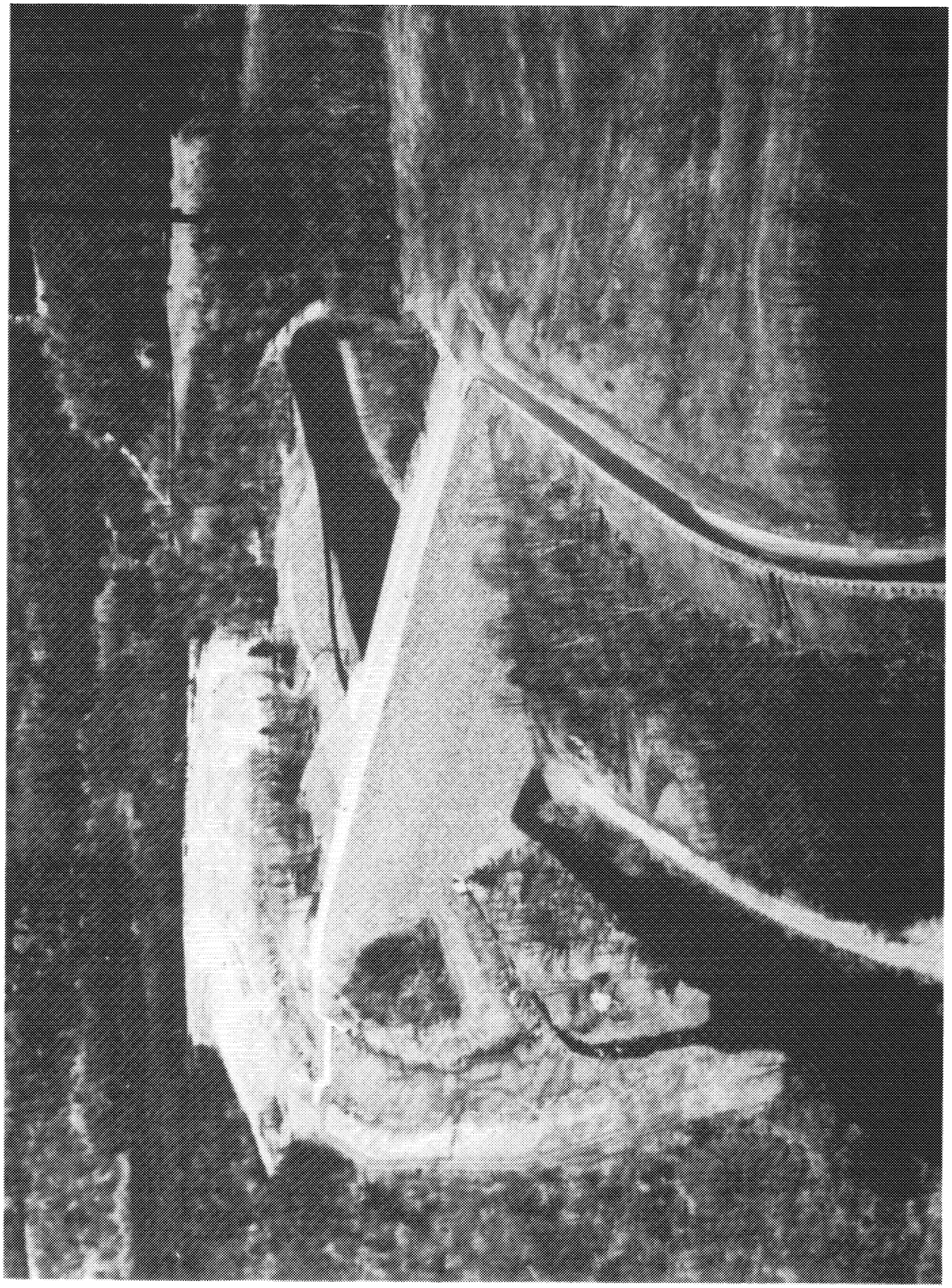
PLATE 3

## CONANT BROOK DAM BREACH FLOOD

CONNECTICUT RIVER BASIN

HYD. AND WAT. QUAL. SECT.
FEBRUARY 1987

Corps of Engineers U.S. Army

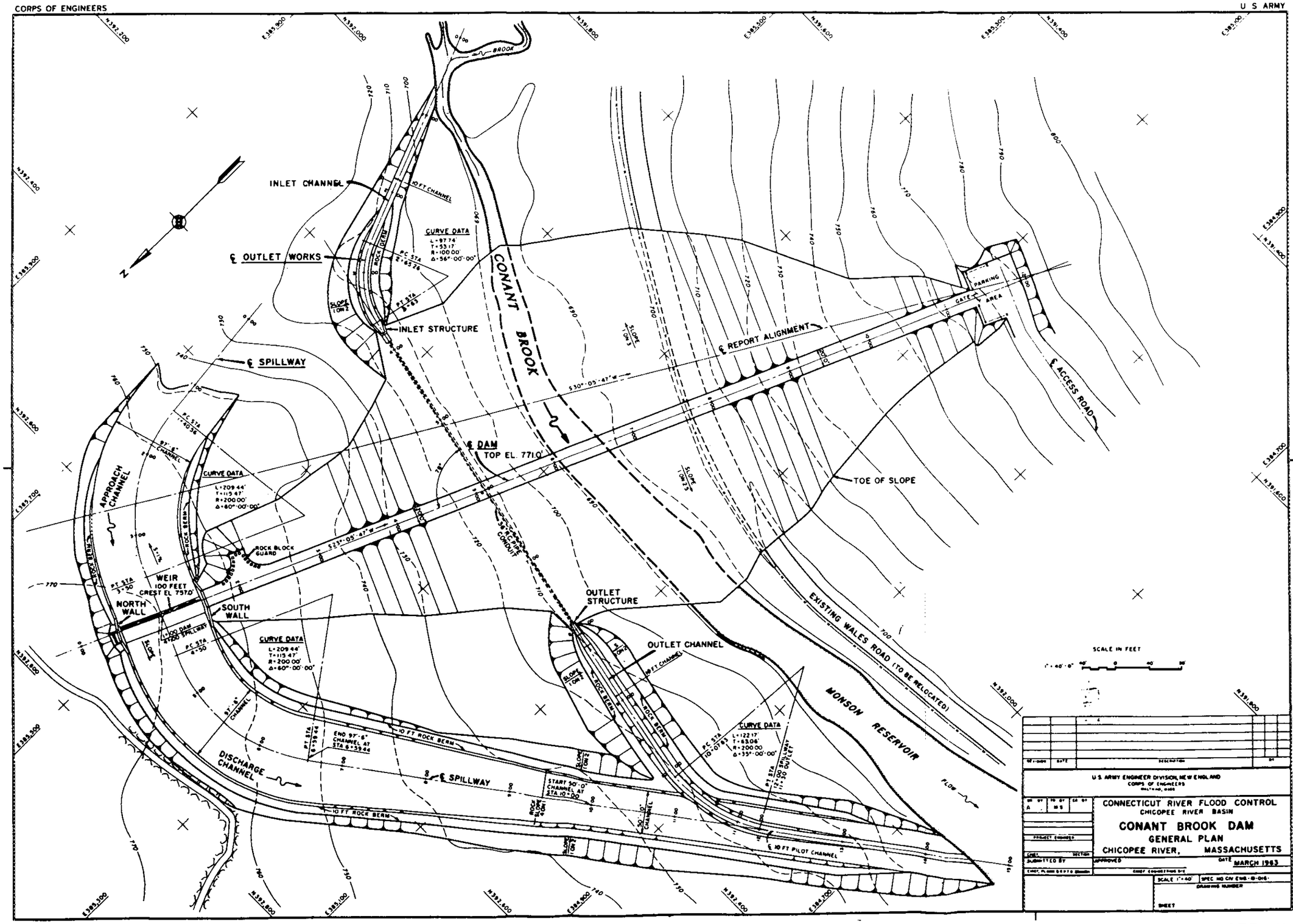


VIEW OF CONANT BROOK DAM

PLATE 4

CORPS OF ENGINEERS

U S ARMY




U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

# CONANT BROOK DAM
## GENERAL PLAN

CHICOPEE RIVER, MASSACHUSETTS

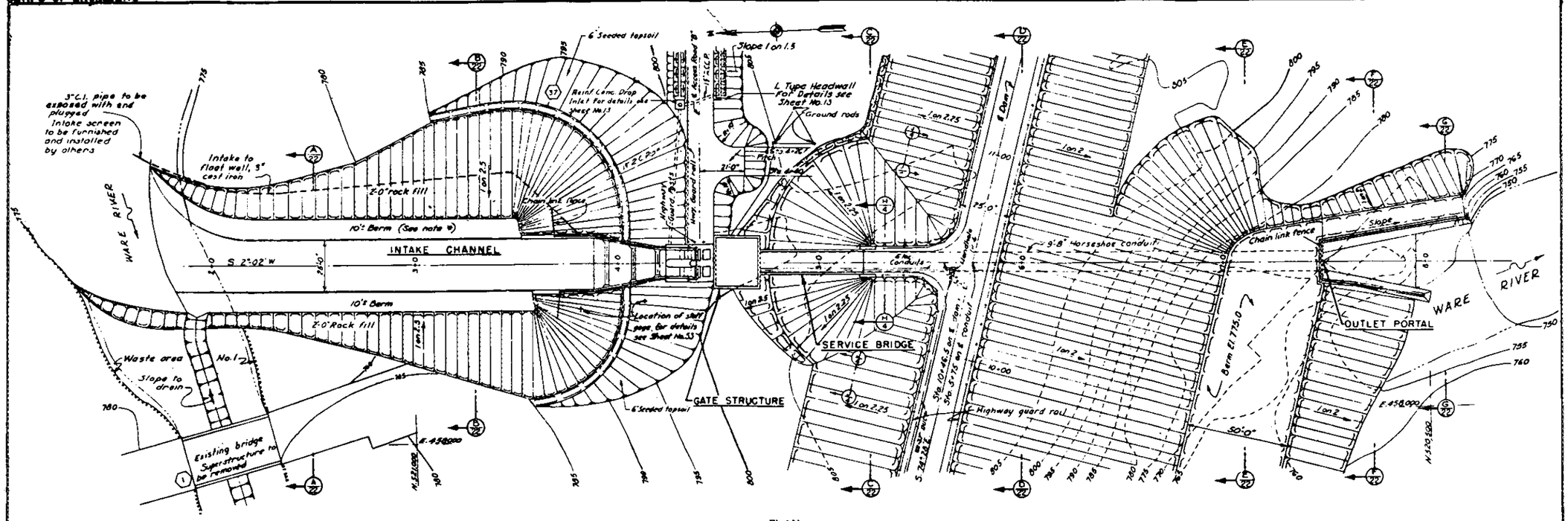
DATE MARCH 1963

SCALE 1"=40'

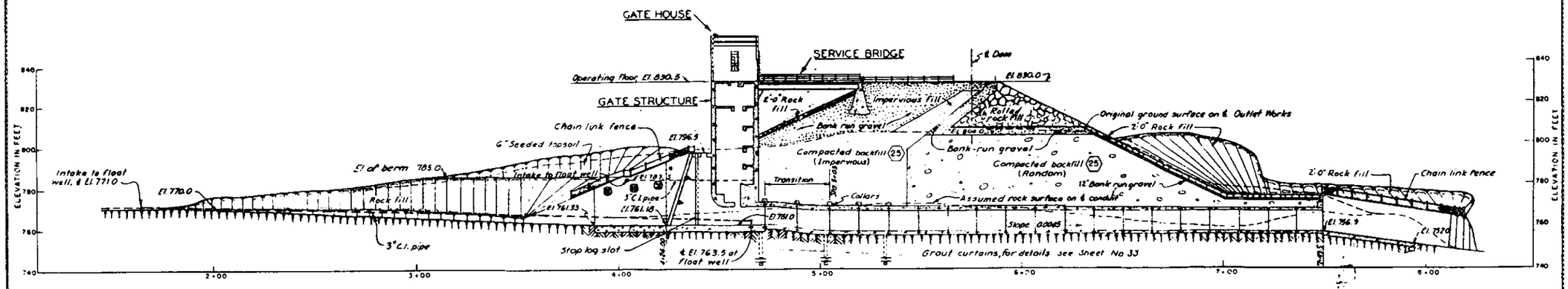
SPEC NO CIV ENG-8-016

PLATE 5

CORPS OF ENGINEERS U.S. ARMY




PLAN
SCALE 1"=20'




PROFILE ALONG ℄ OUTLET WORKS
SCALE 1"=20'

SCALE: 1"=20'

NOTES
Contour interval, 5 feet.
Elevations refer to Mean Sea level Datum.
Grid system based on Mass State Plane Coordinates
# width of rock berms to be varied in the field to obtain regularity of earth slopes minimum width of berm, 5'.

| REVISED | DATE | DESCRIPTION | BY |
|---|---|---|---|

CORPS OF ENGINEERS
U.S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION, BOSTON, MASS.

DRN. BY WKO | SUB. BY KHH | CH. BY WJJ

CONNECTICUT RIVER FLOOD CONTROL
BARRE FALLS DAM
OUTLET WORKS
PLAN AND PROFILE
WARE RIVER MASSACHUSETTS

SUBMITTED BY: CHIEF, ENGINEERING DIVISION
APPROVED BY: DIVISION ENGINEER
DATE: FEB. 1956

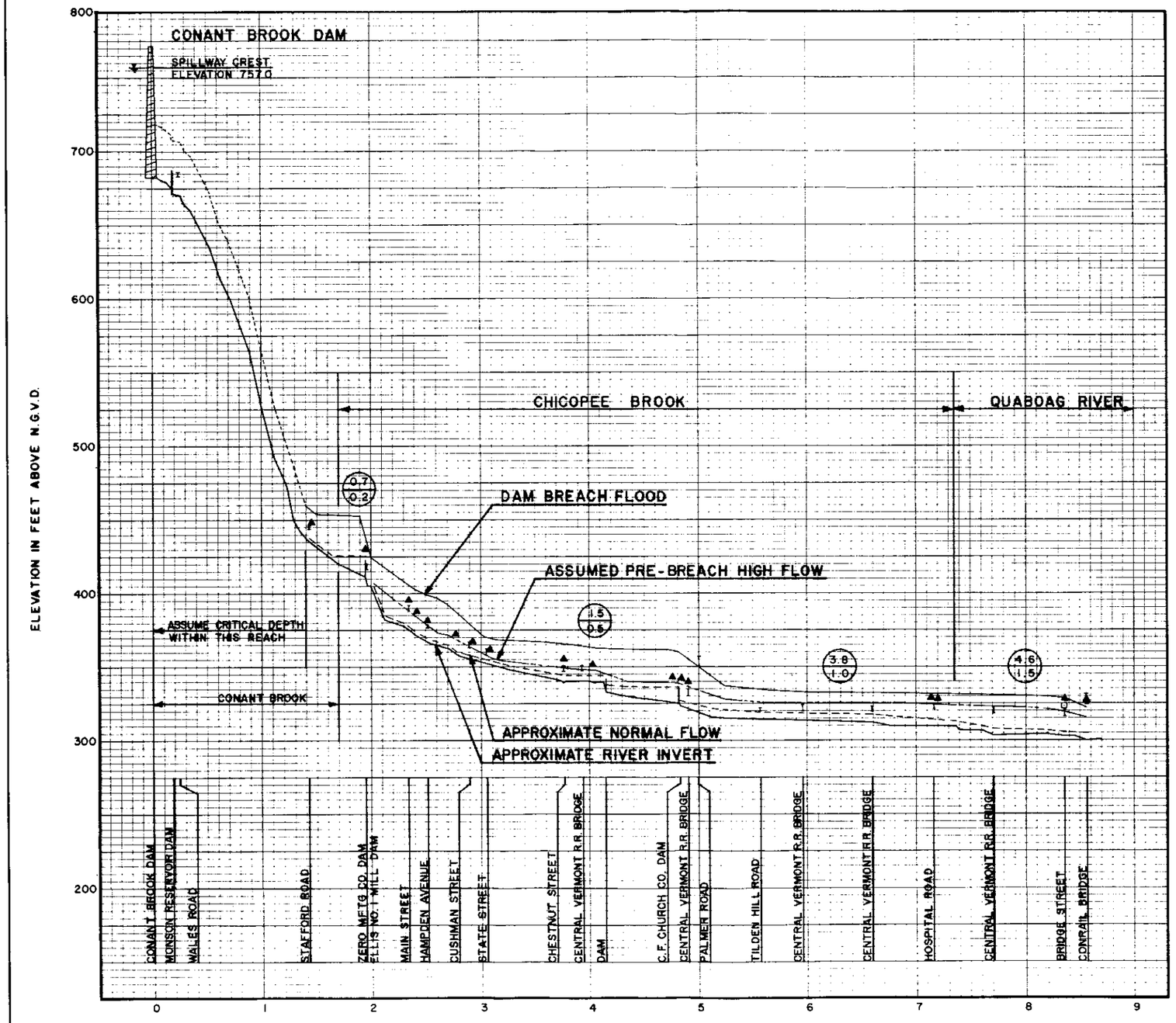
SCALE 1"=20'-0" | SPEC. NO. DIV. ENG-CW-NE

DRAWING NUMBER
CT-1-3093

SHEET 54 OF 72

(REVISED 25 APRIL 1956)

PLATE 6




| LEGEND | | | |
|---|---|---|---|
| 1.5 / 0.5 | HOURS FROM START OF FAILURE TO PEAK STAGE<br>HOURS TO INITIAL RIVER RISE | ▲ | EXPERIENCED AUGUST 1955 FLOOD HIGH WATER MARKS |
| I | BRIDGE | ⊡ | EXPERIENCED SEPTEMBER 1938 FLOOD HIGH WATER MARKS |

SCALE IN MILES
0.0 0.5 1.0

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER BASIN

# CONANT BROOK DAM BREACH FLOOD

PROFILE

HYDRAULICS AND WATER QUALITY SECTION FEBRUARY 1967

PLATE 7

FLOOD LEVELS DOWNSTREAM FROM THIS POINT WILL BE IN THE ORDER OF THE OBSERVED AUGUST 1955 FLOOD

FLOOD LEVELS UPSTREAM FROM THIS POINT WILL BE IN THE ORDER OF THE OBSERVED AUGUST 1955 FLOOD

CONANT BROOK DAM

| LEGEND | | | |
|---|---|---|---|
| | LIMITS OF BREACH FLOOD | —MI | RIVER MILES DOWNSTREAM FROM CONANT BROOK DAM |

SCALE IN MILES

0.0 0.5 1.0

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

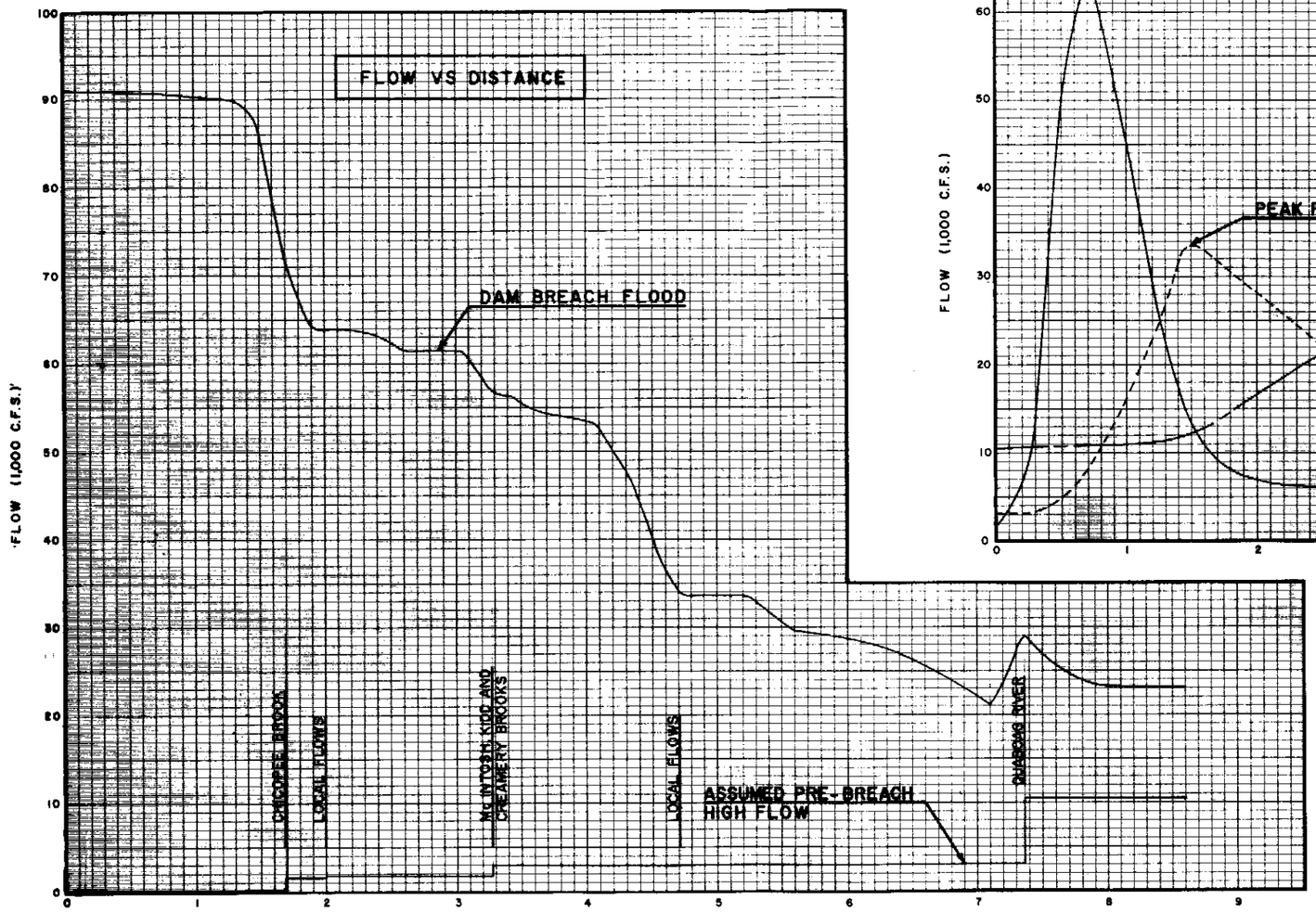
CONNECTICUT RIVER BASIN

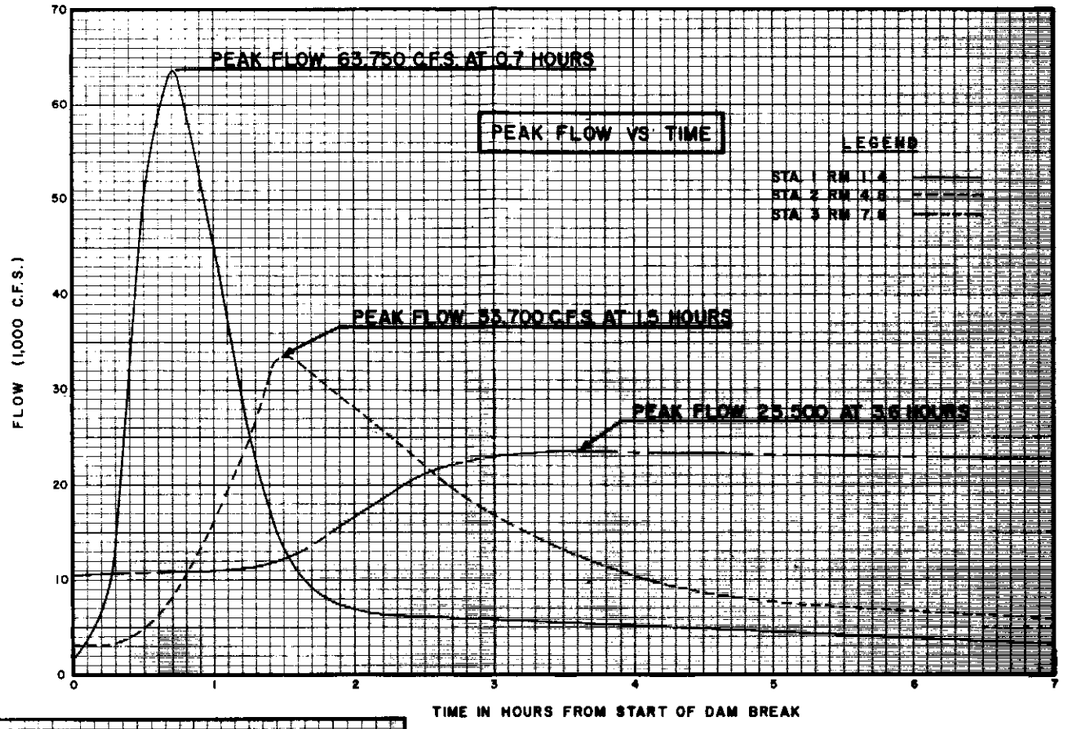
# CONANT BROOK DAM BREACH FLOOD

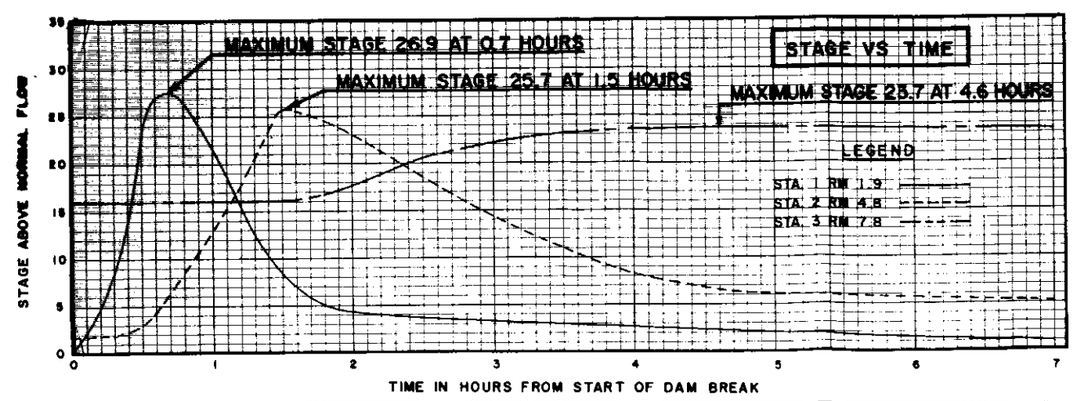
PLAN VIEW

HYDRAULICS AND WATER QUALITY SECTION FEBRUARY 1987

PLATE 8




DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER BASIN

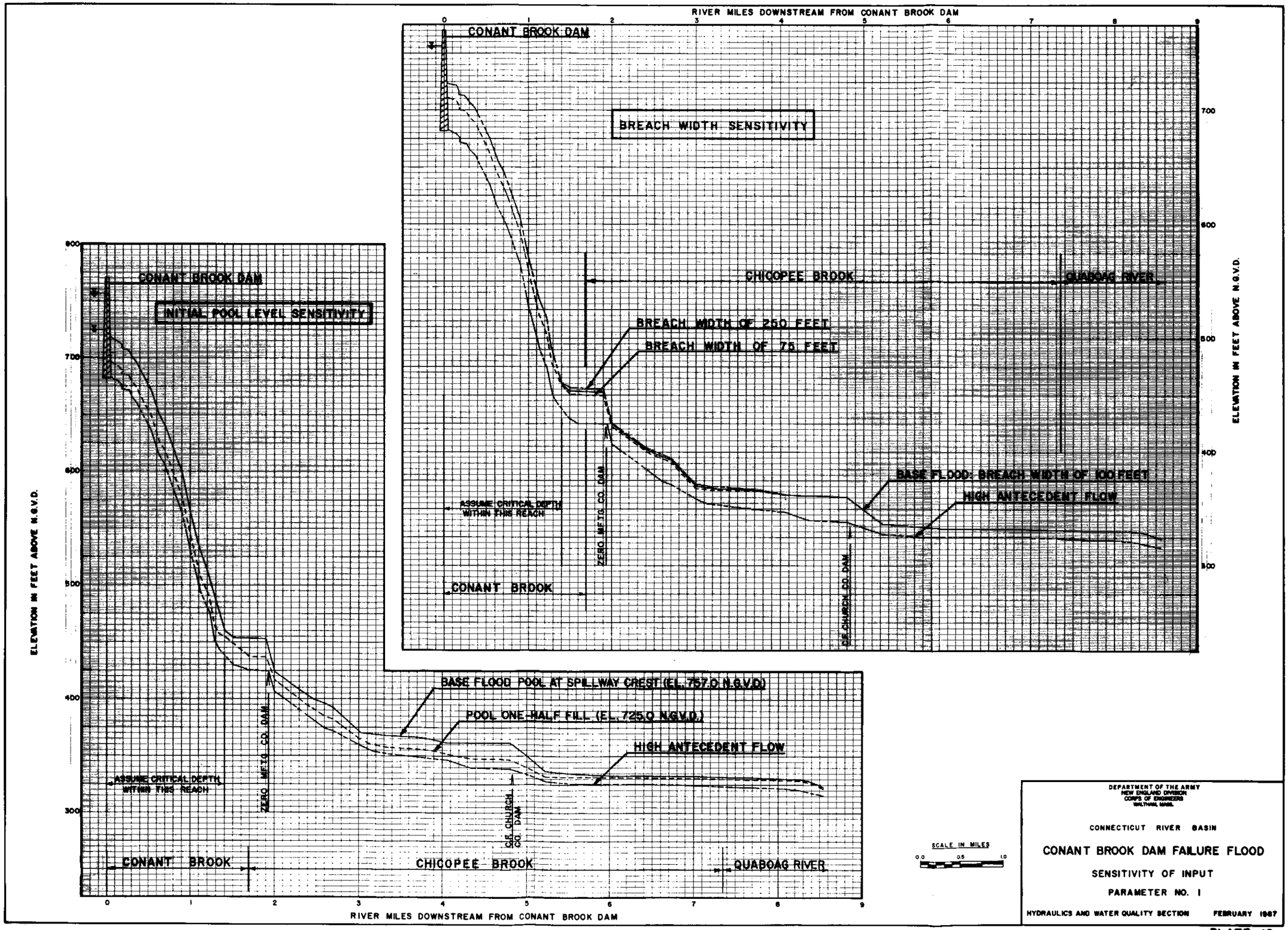
# CONANT BROOK DAM FAILURE FLOOD

## BASE FLOOD DISCHARGE

## STAGE AND TIMING

HYDRAULICS AND WATER QUALITY SECTION — FEBRUARY 1967

PLATE 9




DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER BASIN

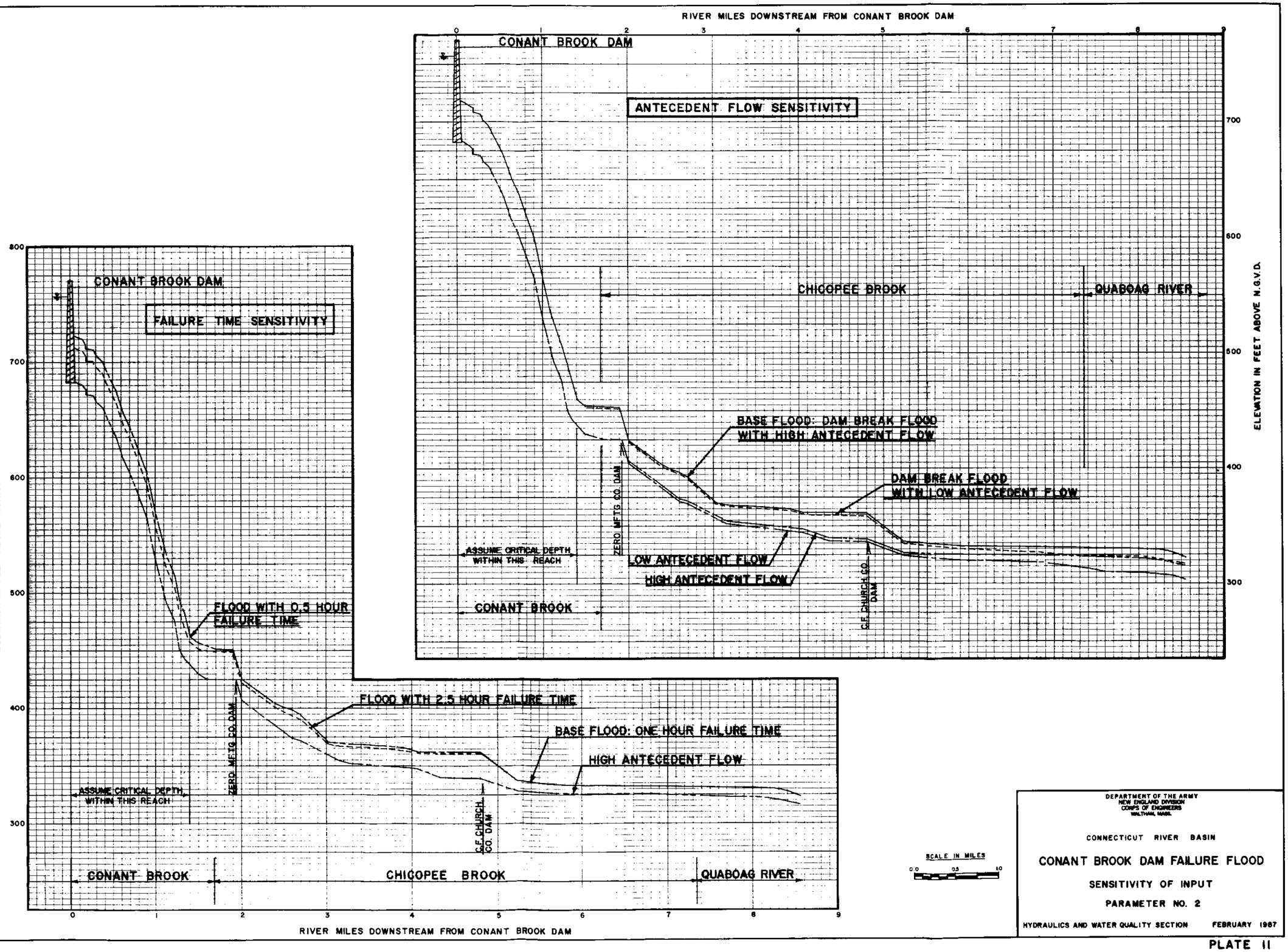
# CONANT BROOK DAM FAILURE FLOOD

## SENSITIVITY OF INPUT

## PARAMETER NO. 1

HYDRAULICS AND WATER QUALITY SECTION FEBRUARY 1967

PLATE 10




DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER BASIN

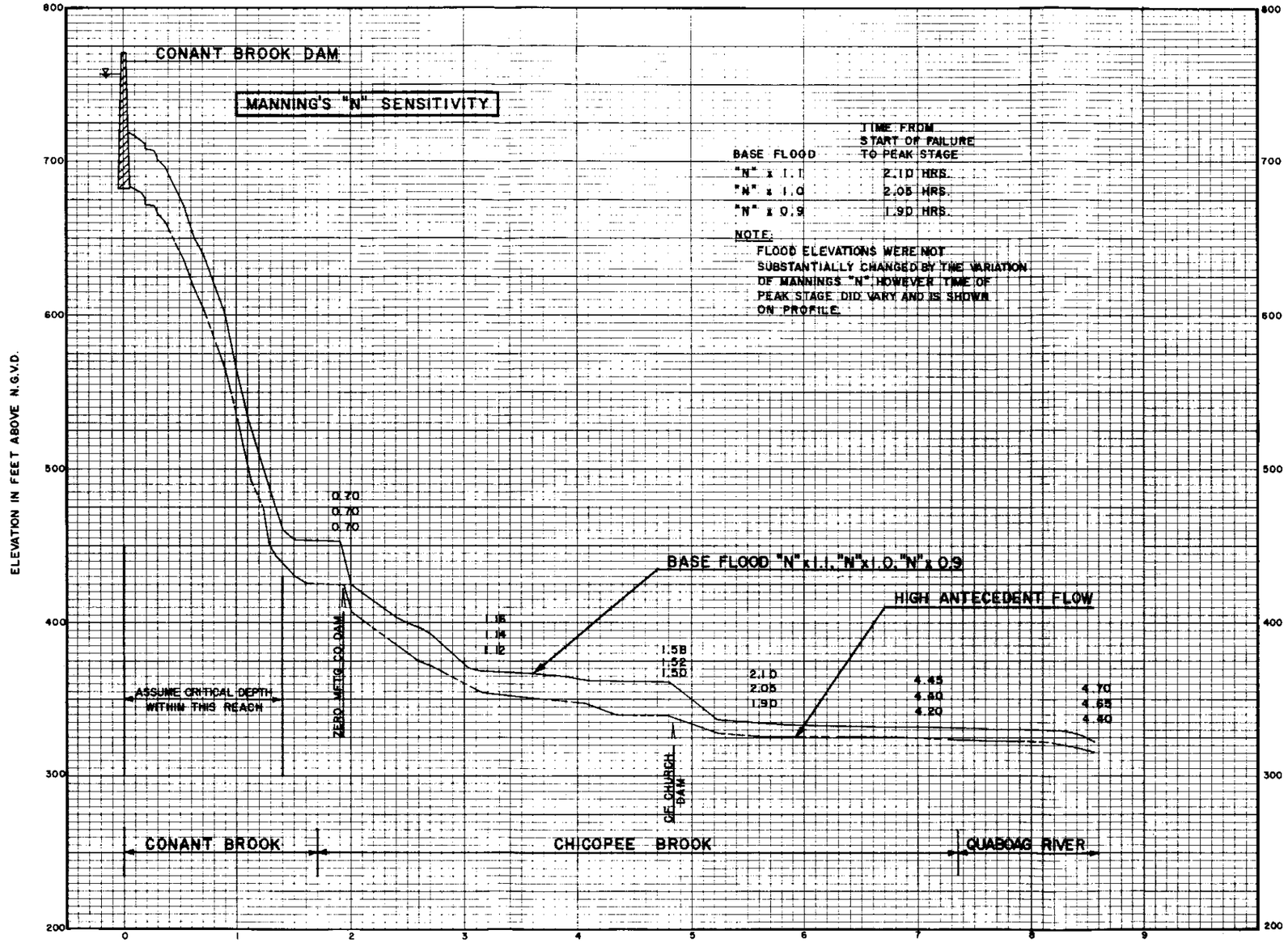
# CONANT BROOK DAM FAILURE FLOOD

## SENSITIVITY OF INPUT

## PARAMETER NO. 2

HYDRAULICS AND WATER QUALITY SECTION FEBRUARY 1967

PLATE II




SCALE IN MILES
0.0 0.5 1.0

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER BASIN

# CONANT BROOK DAM FAILURE FLOOD

## SENSITIVITY OF INPUT

## PARAMETER NO. 3

HYDRAULICS AND WATER QUALITY SECTION FEBRUARY 1984

PLATE 12

```
*HECFORMAT
*ECHO
*FORMATTED
*10FIELDS
*NOCHECK
ID          CONANT BROOK
ID          CONANT BROOK DAM
ID          SZAREK NEDED-WQ
ID          WALTHAM, MA 02254-9149
ID
ID      BASE FLOOD: DAM BREAK FLOOD WITH HIGH ANTECEDENT FLOW
ID
ID CONANT BROOK DAM
ID
IO      9       15
IP      3        1
QI   5500     5400     4800     4500     3550     2950     2550     2150
QI   1900     1700     1300     1050      875
QT      0      0.5        1      1.5      2.5      3.5      4.5      5.5
QT    6.5      7.5      9.5     11.5     13.5
SN CONANT    BROOK
SE    760      753      747      743      731      723      715      693
SS   4475     3190     2500     2110     1250      785      415
DN CONANT    BROOK
DD    771      757              757       65    0.080      693
DB      1      720      150      700      0.5
DO    225     3200
DN ZERO MFTG DAM
DD   1000      423
DQ      0     7000    15000    26500    39000    53000   122700   162700
DH      0        7       12       17       22       27       47       57
DN CHURCH CO. DAM
DD   1100    334.7
DQ      0      510     4000     9000    16500    23000    30000    41000
DH      0      1.7      5.3      8.3     15.3     20.3     25.3     30.3
RN CONANT BROOK
RP      4               -5
RG      1        2        3        4
RC 425.1
ID CONANT BROOK
XI   1.40   10.194      444
XE    433      444      445      449      450      460      470      480
XC     10       25       35       70      650      988     1225     1525
NC 0.090    0.090    0.090    0.090    0.090    0.090    0.090    0.090
ID MONSON RESERVOIR
XI   1.50   10.312      442                        435               -0.8
XE    429      435      436      440      441      450      460      470
XC     30       44       63      150      700      900     1075     1225
XO      0        0        0        0      400      425      450      475
NC 0.090    0.090    0.095    0.095    0.095    0.095    0.095    0.095
QN   1.50            CHICOPEE BROOK
QL   1400     1600     1750     1930     2230     2300     2160     1820
QL   1600     1380     1110      920      800
XI   1.70   11.301      434                        426
XE    421      426      427      430      435      440      450      460
XC     63      325      450      625      875     1150     1575     1675
NC 0.090    0.090    0.095    0.090    0.090    0.090    0.090    0.090
ID  ZERO MANUFACTURING CO.
XI   1.90   12.289      434                        426
```

Plate 13-A

```
XE   420      426      427      430      435      440      450      460
XC   450      525      575      600      675      950     1175     1325
NC 0.090    0.090    0.090    0.090    0.090    0.090    0.090    0.090
RN  ZERO MFTG CO DAM  TO  CHURCH CO DAM
RP     4               -4
RG     1        3       5        9
RC 338.8                        .035
XI  2.00   13.284      416                                 0.1
XE   401      407      409      410      420      430      440      450
XC    25       60       80      110      450      625      790      910
NC  0.06     0.06     0.06     0.06     0.06     0.06     0.06     0.06
QN  2.00          BROOKS     A      AND      B
QL   125      140      155      170      195      200      190      160
QL   140      120       90       60       30
XI  2.71   16.247      370                                 .50
XE   363      364      365      368      370      371      375      380
XC    20       34       40       60       70      130      160      175
XO     0        0        0        0        0      210      720      725
NC  0.08     0.08     0.08     0.08     0.08     0.08     0.08     0.08
XI  3.03   18.230      358                                 0.1     -0.7
XE   353    354.5    356.5      359      360      370      380      390
XC    25       40       60      320      400      900     1110     1130
XO     0        0        0        0        0      600      890     1100
NC  0.06     0.06     0.06     0.06     0.06     0.06     0.06     0.06
XI  3.27   20.217      353                                 0.15      0.2
XE   348      350      354      356      360      370      380      390
XC    30       70      830      880      910      950     1050     1220
NC  0.06     0.06     0.06     0.06     0.06     0.06     0.06     0.06
QN  3.27          MCINTOSH    KIDD    CREAMERY    BROOKS
QL  1280     1440     1610     1775     2035     2095     1980     1660
QL  1440     1250     1050      850      650
XI  4.06   18.176      347
XE   339      340      343      344      345      349      350      360
XC    30       40       65      170      175      210      215      230
XO     0        0        0        0        0        0      160      470
NC  0.08     0.08     0.08     0.08     0.08     0.08     0.08     0.08
XI  4.34   31.161      344                                 0.1     -.75
XE   330      337      339      340      350      360      370      380
XC    30       75      400      500      630      650      670      680
XO     0        0        0        0      120      180      220      260
NC 0.065    0.065    0.065    0.065    0.065    0.065    0.065    0.065
XI  4.57   33.148      337                                 0.1      .27
XE 327.5      332    336.5      340      342      350      370      380
XC   250      300      350      410      740      770     1090     1230
NC 0.065    0.065    0.065    0.065    0.065    0.065    0.065    0.065
XI  4.72   34.140      337                                 0.1
XE   325      332    336.5    339.5      340      341      350      380
XC    85      100      120      160      200      220      300      300
XO     0        0        0        0      100      140      740     1700
NC 0.065    0.065    0.065    0.065    0.065    0.065    0.065    0.065
QN  4.72          BROOK      D
QL    90      105      115      125      145      150      140      120
QL   105       90       70       50       40
XI  4.81   30.136      345
XE   324      332      336      339      340      341      350      370
XC    45       50       50       65      520      550      620      800
NC  0.06     0.06     0.06     0.06     0.06     0.06     0.06     0.06
RN      CHURCH CO. DAM - CONRAIL BRIDGE
RP     4               -2
```

Plate 13-B

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RG | 1 | 2 | 4 | 5 | 7 | 8 | | |
| RC | 0.25 | | | 0.05 | | | | |
| RH | 300 | 311 | 314 | 316.5 | 323 | 325 | 330 | 335 |
| RQ | 0 | 4100 | 8900 | 12200 | 23600 | 27000 | 35800 | 44700 |
| XI | 5.23 | 40.114 | 325 | | | | 0.3 | -0.6 |
| XE | 317 | 320 | 321 | 325 | 329 | 330 | 334 | 340 |
| XC | 20 | 45 | 60 | 380 | 410 | 540 | 600 | 700 |
| XO | 0 | 0 | 0 | 0 | 60 | 230 | 260 | 300 |
| NC | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| XI | 6.28 | | 320 | | | | | |
| XE | 313 | 316 | 317 | 318 | 320 | 330 | 335 | 340 |
| XC | 15 | 30 | 100 | 200 | 500 | 725 | 800 | 850 |
| XO | 0 | 0 | 0 | 0 | 1100 | 1300 | 1400 | 1500 |
| NC | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| XI | 6.78 | 45.032 | 318 | | | | | |
| XE | 310 | 313 | 315 | 320 | 324 | 325 | 329 | 340 |
| XC | 12 | 20 | 100 | 500 | 620 | 650 | 1000 | 1375 |
| XO | 0 | 0 | 0 | 520 | 710 | 750 | 800 | 1000 |
| NC | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| QN | 6.78 | | QUABOAG | RIVER | | | | |
| QL | 7450 | 7930 | 8610 | 9290 | 10840 | 12380 | 13740 | 15090 |
| QL | 15960 | 16560 | 16250 | 15290 | 14130 | | | |
| XI | 7.04 | | 316 | | | | | |
| XE | 309 | 313 | 315 | 320 | 322 | 325 | 330 | 340 |
| XC | 12 | 20 | 120 | 350 | 460 | 650 | 1000 | 1100 |
| XO | 0 | 0 | 0 | 1050 | 1250 | 1550 | 2100 | 2400 |
| NC | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| XI | 7.39 | | 314 | | | | | |
| XE | 308 | 310 | 314 | 315 | 320 | 324 | 330 | 340 |
| XC | 20 | 60 | 320 | 400 | 490 | 560 | 670 | 860 |
| XO | 0 | 0 | 350 | 350 | 360 | 680 | 650 | 575 |
| NC | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| XI | 7.59 | | 311 | | | | | |
| XE | 306 | 307 | 311 | 313 | 324 | 329 | 331 | 340 |
| XC | 20 | 70 | 165 | 355 | 420 | 450 | 460 | 520 |
| XO | 0 | 0 | 0 | 0 | 0 | 630 | 715 | 720 |
| NC | 0.060 | 0.060 | 0.060 | 0.60 | 0.060 | 0.060 | 0.060 | 0.060 |
| XI | 7.81 | | 310 | | | | 0.1 | -0.6 |
| XE | 303 | 308 | 310 | 315 | 320 | 325 | 330 | 340 |
| XC | 20 | 100 | 160 | 470 | 630 | 750 | 860 | 1080 |
| XO | 0 | 0 | 250 | 380 | 560 | 660 | 760 | 700 |
| NC | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 |
| XI | 8.56 | | 310 | | | | | |
| XE | 299 | 307 | 324 | 327 | 330 | 331 | 332 | 340 |
| XC | 40 | 75 | 78 | 105 | 130 | 140 | 220 | 280 |
| XO | 0 | 0 | 0 | 80 | 145 | 175 | 190 | 265 |
| NC | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 |
| ZZ | | | | | | | | |